Back Belts: A Review of the Literature

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Topics

- Background
- Study Selection
- Review of the Studies
- Conclusion

Background

- Manufacturer push of back belts as prevention
- Some local policies requiring them
- NIOSH and OSHA statements
- DOD policy

Study Selection

- Non-scientific search of the literature using search term: back belts
- Not a meta-analysis
- Some studies missed
- Attempted to find those with prospective design and injury endpoints

Study 1

- Reddell CR et al. “An evaluation of a weightlifting belt and back injury prevention training class for airline baggage handlers” *Applied Ergonomics* 23 (5) 319-329 (1991?)
- 642 baggage handlers; compared 4 groups:
  - Belt only (OK-1 weightlifting belt) (57)
  - Training only (video, booklet, hands-on demo) (122)
  - Belt and training (57)
  - Nada (248)

Study 1: Outcomes Measured

- Measured
  - Pre-study back injury/back pain history
  - Lumbar injury incident rate
  - Restricted workday case rate
  - Lost workday rate
  - Restricted workday rate
  - Workers' compensation rate
  - Compliance
  - Comfort

Study 1: Findings

- 58% of those issued belt stopped using it (maintained in study for analysis); many comfort-related complaints
- No significant difference in any metric except marginally significant difference in the lost workday case injury incident rate between dropout groups and the non-belt groups.
- 5/28 lumbar strains were while wearing the belt
- Neither belt nor training had significant effect on injury reduction

Study 1: Comments

- Small study
- High drop-out rate
- Controlled and prospective designs are a plus

Study 2

- Mitchell LV et al. “Effectiveness and Cost-Effectiveness of Employer-Issued Back Belts in Areas of High Risk for Back Injury.” *JOM* Vol 36, Jan 1994, 90-94
- Retrospective survey instrument to 1136 workers at Tinker AF base

Study 2: Outcomes Measured

- Belt use
- Lifting requirements
- Injury and treatment history
- Lost and restricted work days
- Costs related to
  - Providing belts
  - Injury treatment
  - Lost work days

Study 2: Background and Design

- TAFB Policy: Back belt provided at request of workers who lift/push/pull items > 20 lbs more than 50% of shift. Mandated use with same risk factors if history of a back injury in past 2 years.
- Survey administered at safety meetings
- 98% participation

Study 2: Findings

- Best predictors of back injury were:
  - Previous injury
  - Daily lifting activities
- Back belt use was marginally effective in preventing initial back injury
- Those injured while wearing belts had more serious and costly injuries
- Cost-effectiveness of belts not established

Study 2: Comments

- Strengths:
  - Fair size
  - High participation rate
- Weaknesses:
  - Possible recall bias
  - Estimated costs

Study 3

- Kraus JF et al. "Reduction of Acute Low Back Injuries by Use of Back Supports" *Int J Occup Environ Health* Vol 2, 1996: 264-273
- The Home Depot Study – longitudinal follow-up over 6 years, before/after mandatory back belt policy

Study 3: Measurements

- Working hours and lifting intensity
- Back support use (assumed when policy)
- Age and gender
- Outcome – back injury incidence

Study 3: Findings and Comments

- Findings:
  - 34% reduction in back injury rates
  - Highest reduction in years 1-2 on the job
- Comments:
  - Simultaneous changes in lift assist (pallets and forktrucks) a confounder
  - Belt use not ascertained – assumed
  - Not randomized

Study 4

- Van Poppel MNM et al., “Lumbar Supports and Education for the Prevention of Low Back Pain in Industry” *JAMA* Vol 279, 1998: 1789-1794
- A randomized controlled trial in the cargo dept of Dutch airline

Study 4: Design and Methods

- 312 workers randomized, 282 available for follow-up at 6 months
- Baseline demographics, history, work perception, health status
- 4 groups:
  - Education and belt (70/59)
  - Education (82/73)
  - Belt (83/66)
  - Nada (77/70)

Study 4: Outcomes Measured

- Monthly questionnaires during study period
  - Belt use
  - Low back pain incidence
  - Sick leave due to back pain
- Baseline and end trunk-muscle strength

Study 4: Findings

- 82% completion of 6 month follow-up (withdrawals about even among the 4 groups)
- Compliance with belts 42% an 43%) but analysis on just those compliant showed no difference
- Low back pain incidence and reports of sick leave use due to back pain about the same – no significant difference in any of the groups
- No significant difference in pre- and post-study trunk muscle strength in groups
- Belt use decreased number of sick days used for LBP among subjects with LBP at baseline

Study 5

- Thomas JS, et al. "Effect of Lifting Belts on Trunk Muscle Activation during a Suddenly Applied Load" *Human Factors* Vol 41, Dec 1999: 670-676.
- Biomechanical study on belt use and trunk muscle response – do belts stiffen the torso during sudden loading?

Study 5: Design

- 10 men and 10 women – 20-33, screened out any with LBP in last year
- Conditions of symmetric and asymmetric applied load, loose and tight belt tension, three trials for each set of conditions
- Load was lead shot dropped 1 m and attached to trunk harness with a pulley system
- Trunk kinematics measured with the Lumbar Motion Monitor and surface EMG

Study 5: Findings and Comments

- During asymmetric sudden loading, belts minimally reduce lateral bending motion and contralateral spinae activity but opposite finding in symmetric loading
- Effects were too small for clinical significance
- Sudden loading is not representative of most material handling

Study 6

- Wasell JT, et al. “A Prospective Study of Back Belts for Prevention of Back Pain and Injury”, *JAMA* Vol 284, Dec 6, 2000, 2727-2732.
- Large prospective cohort study by NIOSH of 160 stores over 2 years.
- Measured self-reported LBP and back injury claim rate.

Study 6: Design

- Identified material handling employees in 160 new retail stores
  - 89 required back belt use
  - 71 had voluntary back belt use
- Referred sample of 13,873 employees
  - 9377 baseline interviews (204 refused)
  - 6311 (67%) follow-up interviews
- No interviews mid-December thru mid-January
- Median follow-up time was 6.5 months

Study 6: Interview Questions

- Demographics
- Lifestyle
- Back belt use
- Job tasks and work history
- Previous back injury
- Medical history
- Satisfaction
- Back pain symptoms

Study 6: Findings

- Used payroll data and workers' compensation data to calculate injury rates
- 58% reported compliance with daily use of belts in stores with mandatory policy
- **No difference** in back injury rates or reported back pain in those that reported usually using the belts with those who reported never using them
- Best predictor of both outcomes was history of previous back injury

Study 6: Strengths and Limitations

- Strengths:
  - Large
  - Prospective
  - Controlled for a wide range of possible confounders
- Limitations:
  - Back belt use self-reported
  - Possible selection bias from incomplete follow-up
  - Not randomized

Study 7

- Kraus JF, et al. "A Field Trial of Back Belts to Reduce the Incidence of Acute Low Back Injuries in New York City Home Attendants" *Int J Occup Environ Health* Vol 8, 2002: 97-104.
- Randomized controlled trial of belt use vs. lifting advice vs. nada in 12,772 home attendants.

Study 7: Design

- NYC home health agencies, participants randomized by agency
- Employees in belt agencies were required to use belts (spot checks – 92% compliance)
- Employees in advice-only agencies knew about study but were not given belts
- Employees in control agencies were not told of study – passively followed
- 28 months of follow-up from start to end

Study 7: Outcomes

- Exposure assessment was hours worked
- Baseline demographics, history of injury and exercise habits, and calculation of BMI
- Acute onset, physician diagnosed injury to the low back that occurred during a work activity
- Data source – standard claim form

Study 7: Findings

- Belts protected
  - Injury rate ratio in advice only vs. belts was 1.18 (not statistically significant)
  - Injury rate ratio in control vs. belts was 1.36 (statistically significant)
  - Statistically significant effects restricted to 45-54 age group
  - Increasing age and increasing years in the business were slightly protective
  - Strongest predictor was past back injury
  - Belt use more protective in those with currentback problems and past back injury

Study 7: Comments

- Effects were small and restricted to subgroups; small numbers of events
- Randomized and prospective, large study are strengths
- No attempt to quantify seriousness of injuries among belt users vs. non-users
- Non-claimed injuries may have been missed (not likely to differ among groups)

Summary

- Most studies so far show no protective effect
- A couple of studies show modest effect
- Impact of lifting aids, engineering approaches is likely to be greater
- Considered as a whole, literature supports current DOD policy

DOD Policy

The Department of Defense does not recognize back support belts or wrist splints as personal protective equipment, or the use of these devices in the prevention of back or wrist injuries. These devices are considered medical appliances and may be prescribed by credentialed health care providers who are responsible for medical clearance, monitoring and proper fit.

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Questions?

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